

CLAIMS

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1. Gram-negative mutant of a mucosal bacterium, comprising a mutation such that it is viable, is capable of OMP formation and lacks endotoxic lipopolysaccharide (LPS), the mutant being free of LPS.

2. Gram-negative mutant according to claim 1 comprising a mutation such that it is free of Lipid A.

3. Gram-negative mutant according to claim 1 ~~or 2~~, said bacterium being selected from the group comprising diplococci.

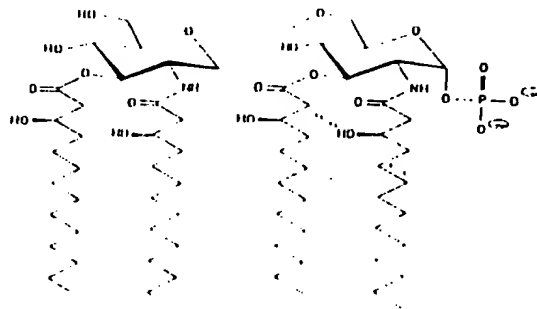
4. Gram-negative mutant according to ~~any one of claims 1-3~~ ^{claim 1}, said bacterium being selected from the group comprising gonococci, e.g. *N. gonorrhoeae*.

5. Gram-negative mutant according to ~~any one of claims 1-3~~ ^{claim 1}, said bacterium being selected from the group comprising meningococci e.g. *N. meningitidis*.

6. Gram-negative mutant according to claim 1 ~~or 2~~, said bacterium being selected from the group comprising *Bordetella*, e.g. *Bordetella pertussis*.

7. Gram-negative mutant according to ~~any one of the preceding claims~~ ^{claim 1}, said mutant comprising a mutation in at least one gene associated with Lipid A biosynthesis.

8. Gram-negative mutant according to ~~any one of the preceding claims~~ ^{claim 1}, said mutant comprising a mutation in at least one gene associated with the early stage of Lipid A biosynthesis, said early stage being prior to formation of the following structure



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aa 9. Gram-negative mutant according to ~~any one of the preceding claims~~ ^{claim 1}, said mutant comprising a mutation in at least one gene selected from the group comprising *lpxA*, *lpxD* and *lpxB*.

aa 5 10. Gram-negative mutant according to ~~any one of the preceding claims~~ ^{claim 1}, said mutant comprising a mutation in at least the gene *lpxA*.

aa 11. Attenuated live vaccine against a gram-negative mucosal bacterium, said vaccine comprising a mutant according to ~~any one of claims 1-10~~ ^{claim 1} as an active component and a pharmaceutically acceptable carrier.

aa 12. Whole cell vaccine against a gram-negative mucosal bacterium, said vaccine comprising a mutant according to ~~any one of claims 1-10~~ ^{claim 1} as an active component and a pharmaceutically acceptable carrier.

aa 13. OMP vaccine against a gram-negative mucosal bacterium said vaccine comprising OMP derived from a mutant according to ~~any one of claims 1-10~~ ^{claim 1} as an active component and a pharmaceutically acceptable carrier.

aa 14. Vaccine according to ~~any one of claims 11-13~~ ^{claim 1} further comprising an adjuvant.

aa 15. Vaccine according to ~~any one of claims 11-14~~ ^{claim 1} said vaccine being substantially free of endotoxic LPS, wherein substantially free is defined as LPS-free according to the Limulus assay.

aa 16. A method of producing LPS-free vaccine comprising application of a mutant according to ~~any one of claims 1-10~~ ^{claim 1} and/or a ~~part~~ ^{part} ~~derived from~~ ^{derived from} said mutant as active component of a vaccine in a manner known per se for preparing vaccine formulations, said method being free of measures to remove LPS by purification.

aa 17. A method of producing LPS-free OMP comprising culturing a mutant according to ~~any one of claims 1-10~~ ^{claim 1} and ~~deriving~~ ^{deriving} an OMP comprising fraction from said culture in a manner known per se for isolating protein from bacterial culture, said method being free of

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additional measures to remove LPS from said culture or OMP comprising fraction.

18. OMP which is free of LPS.

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